

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION

See paragraph 2 below

International application No.
PCT/US2007/079781

International filing date (day/month/year)
27.09.2007

Priority date (day/month/year)
27.09.2006

International Patent Classification (IPC) or both national classification and IPC
INV. G06F9/38

Applicant
QUALCOMM INCORPORATED

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of
this opinion

See form
PCT/ISA/210

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2007/079781

Box No. I Basis of the opinion

1. With regard to the language, this opinion has been established on the basis of:
 the international application in the language in which it was filed
 a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 a sequence listing
 table(s) related to the sequence listing
 - b. format of material:
 on paper
 in electronic form
 - c. time of filing/furnishing:
 contained in the international application as filed.
 filed together with the international application in electronic form.
 furnished subsequently to this Authority for the purposes of search.
4. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2007/079781

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or
industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	<u>1-28</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-28</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-28</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V.

1. Reference is made to the following documents:
D1 : US 5 758 143 A (LEVITAN DAVID STEPHEN [US]) 26 May 1998 (1998-05-26)
2. The following is remarked subject to what is set out in point 5 below.
 - 2.1 Document D1, which is considered to represent the most relevant state of the art, discloses (the references in parentheses applying to this document) a method of resolving simultaneous predicted branch instructions, comprising
 - processing two predicted branch instructions, each predicted branch instruction having a predicted state and a corrected state, said predicted branch instructions entering a resolution stage simultaneously;
 - determining which ones of the predicted branch instructions has mispredicted and directing future instruction fetches based on an accordingly corrected state.

From this, the subject-matter of independent claim 1 differs in that in claim 1 resolving takes place before validation by replacing the determining with the step of selecting one of the corrected states from one of said predicted branch instructions, and then determining whether any branch has mispredicted and (*if so* - see point 5 below), directing future instruction fetches based on the selected corrected state (*if correctly selected* - see point 5 below).

- 2.2 The subject-matter of claim 1 is therefore novel (Article 33(2) PCT)
The problem to be solved by the present invention may be regarded as how to achieve the effect of speeding up branch resolution for multiple branches.
- 2.3 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

Using a corrected state before validation is not known in this context from the prior art. Its combination with simultaneous branch resolution provides for a possible early resolution because if there was a mispredict and the selected corrected state was

correct, then the resolution stage can end early.

3. Claims 10 and 19 mutatis mutandem comprise essentially the same subject matter as claim 1 and are allowable too for the reasons set out in point 2 above, but also subject to point 5 below.
4. Claims 2-9, 11-18 and 20-28 are dependent on respectively claims 1, 10 and 19 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Re Item VIII.

5. In order to achieve the effect mentioned above, it is essential that the last step of the independent claims (fetching instructions based on the selected state) should comprise the following (Rule 6.3(a) PCT):
 - i. a clarification that the step is taken only when a misprediction took place (application, figure 4, box 404 - > box 406); and
 - ii. directing future instruction fetches based on the selected corrected state if correctly selected (see application, figure 4, box 410).